



AN OVERVIEW OF REGULATIONS FOR LEAD LEVELS IN DRINKING WATER SYSTEM COMPONENTS





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Since the establishment of the federal Safe Drinking Water Act (SDWA) more than 35 years ago, the safety of the U.S. drinking water supply has been an ongoing priority for health regulatory officials. Starting with a list of just 25 potential contaminants in 1974, federal regulations administered by the U.S. Environmental Protection Agency (EPA) currently identify maximum concentration levels in drinking water for more than 100 different chemicals. In addition, a number of individual states and local jurisdictions have implemented requirements to ensure the safety of drinking water from source to tap.

While the list of regulated chemicals in drinking water expands as new potential contaminants are identified, the presence of lead continues to receive special scrutiny. Lead is not normally found in source water, but can enter drinking water systems through the corrosion of the pipes and plumbing fixtures. Therefore, regulatory efforts to reduce the presence of lead in drinking water primarily focus on the lead content of drinking water system components.

Among the most recent efforts in this area is the passage of the federal Reduction of Lead in Drinking Water Act signed into law by President Barack Obama in January 2011. The new law redefines “lead-free” under the SDWA to further restrict permissible levels of lead in drinking water system components. In this case, federal action follows the implementation of strict regulations in California and Vermont, where tighter limits on lead content have been in place since early 2010, and in Maryland where similar restrictions become effective in January 2012.

While the complete implementation of these recent regulatory changes will play out over the next few years, the trend toward increased regulation of the lead content of drinking water system components is clear. Yet, confusion still exists among manufacturers and distributors regarding federal and state requirements for lead content in drinking water system components, and what steps manufacturers should take to ensure that their products are compliant now and in the future.

This white paper from UL presents an overview of the federal and state requirements governing the lead content in drinking water system components. It also reviews and discusses the standards and testing protocols that currently apply to these products as well as anticipated changes in the current standards. Finally, the paper identifies the likely enforcement mechanisms for lead content regulations and outlines compliance options for manufacturers.





Federal Regulations on Lead in Drinking Water System Components

Although lead has been used extensively for thousands of years in a wide range of household products, including plumbing materials and paint, it is a potent, neurotoxic metal that accumulates in both soft tissue and bones. Even low-level exposure can lead to a range of adverse health effects, including brain, nervous system and blood disorders. According to the EPA, children six years old and younger are at greatest risk, since exposure can adversely affect brain development, leading to learning disabilities and behavior problems¹.

Concentrations of lead found in drinking water do not usually derive from natural sources. Instead, the most common cause of lead concentrations in water is due to contamination from the gradual corrosion of water supply pipes and plumbing fixtures as well as the solder or flux used in their installation and repair. Accordingly, most current regulatory efforts to control lead in drinking water focus primarily on reducing the lead content of these system components.

Federal efforts to control concentrations of lead and other contaminants in drinking water began in 1974 with the passage of the SDWA. Under the SDWA, the EPA is mandated to set enforceable maximum containment levels (MCLs) for contaminants. Public water systems are then required to ensure that the concentrations of contaminants in their water supplies comply with the MCLs, most often by using suitable technologies to treat the water and to

minimize the risk of the contaminants.

As originally implemented, the SDWA required public water systems to minimize lead concentrations by controlling the corrosion that resulted in lead leaching from the water system infrastructure. Typically, such control was achieved through careful management of the water's mineral content, acidity and temperature as well as through the proper maintenance and replacement of the water system's piping.

But while effective in controlling lead concentrations after the fact, this approach did little to control the original source of the lead found in drinking water, that is, the pipes and fittings used in the installation and repair of public water systems. It also did not address plumbing fixtures found in residences and other extensions of public water systems.

To address these and other concerns, the SDWA was amended in 1986. Under a new Section 1417, the amended SDWA mandated that all pipes, solders, pipe fittings and plumbing fixtures used in the installation or repair of any public water system, or any residential or nonresidential facility that provides water for human consumption be "lead-free." Under the SDWA lead-free restrictions, pipes and fittings were limited to not more than 8.0% lead, and solders and flux could not contain more than 0.20% lead by weight. In addition, plumbing fittings and fixtures were limited to not more than 4.0% (measured by dry weight) after Aug. 6, 2001.

The EPA's control over the lead content of drinking water systems and components was further strengthened in 1996, with

UL's Involvement in Development of Pb Standards and Testing

- Ensure safety of U.S. water supply and has played a key role in the development of standards and testing protocols regarding lead.
- Evaluation of products and materials for lead content as part of the Restricted Substance Compliance Solutions program.
- Contribute expertise in development of lead content requirements for evaluating products against the new California regulations.
- Interpreted the California law as also requiring manufacturers to test their products as part of the initial certification of drinking water system components.
- Published Subject Outline 116875 – Lead (Pb) Content Verification Of Products In Contact With Potable Water, which contained material testing requirements for lead.
- Support the development of a new industry standard that would address the lead content testing requirements.
- Provide manufacturers with a clear path to demonstrate compliance with existing and anticipate state and federal requirements.
- Exemplify the historic mission to protect the safety and health of consumers in the United States and around the world.



an additional amendment to Section 1417 of the SDWA. In addition to requiring water systems to issue an annual public report on their water quality, the amended SDWA established a two-year deadline for the creation of a voluntary standard addressing maximum leaching levels for lead used in plumbing fittings and fixtures. The amended law also gave the EPA temporary enforcement authority against noncompliant plumbing fittings and fixtures.

The 2011 Reduction of Lead in Drinking Water Act

The most recent development in federal regulations governing the lead content of drinking water system components is the enactment of the Reduction of Lead in Drinking Water Act, signed into law by President Barack Obama in January 2011². The Act effectively reduces the permissible lead content in plumbing fittings and fixtures by further modifying the SDWA definition of lead-free. However, rather than setting new lead limit benchmarks, the Act effectively brings federal lead content limits in line with those already in force in California and Vermont and adopts lead content assessment protocols consistent with those developed in support of these state regulatory efforts.

Under the Reduction of Lead in Drinking Water Act, the SDWA definition of the term lead-free has been modified to reduce the maximum lead content to “not more than a weighted average of 0.25% (lead) when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.”

At the same time, the Act retains the 0.20% lead limit for solders and flux first implemented in 1986 and stipulates a method for calculating the weighted average lead content.

Exempted from the provisions of the Act are pipes and plumbing fixtures that are used exclusively for nonpotable water services, such as those found in manufacturing and industrial processing applications, and for those used in outdoor irrigation and watering systems. Also exempt are toilets, bidets, urinals, flushometer valves, shower valves and water distribution main gate valves two inches or larger in diameter.

The provisions of the federal Reduction of Lead in Drinking Water Act come into effect in January 2014. However, more restrictive state limits are already in effect in California and Vermont, and new lead content restrictions are set to take effect in Maryland in January 2012. Therefore, in an effort to achieve market acceptance in these and other states, it is anticipated that manufacturers will bring their products into compliance with the new federal lead content limits as soon as possible.

State Regulations on Lead in Drinking Water System Components

As previously noted, recent federal efforts to reduce the lead content of plumbing fittings and fixtures have followed the lead of state jurisdictions. The most notable developments have occurred in California, beginning with the passage of California Assembly Bill 1953 (AB 1953) in September 2006. Since then, other states,

including Vermont and Maryland, have passed comparable laws limiting lead content in plumbing fittings and fixtures as a way of reducing lead concentrations in drinking water, and other states are evaluating legislation with similar import.

In California, AB 1953 was the first state effort to implement limits on lead content in plumbing fittings and fixtures that were more restrictive than federal requirements. AB 1953 became law in September 2006, with an effective enforcement date of Jan. 1, 2010. The law has been codified in the state’s Health and Safety Code (HSC), Section 116875, and falls under the jurisdiction of the California Department of Toxic Substances Control (DTSC).

The key change mandated by AB 1953 is the reduction of lead in wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures to a weighted average of not more than 0.25% (the 0.20% lead content limit for solder and flux remained unchanged). Further, as implemented under HSC 116875, “no person shall introduce into commerce any pipe, pipe or plumbing fitting, or fixture intended to convey or dispense water for human consumption through drinking or cooking that is not ‘lead-free’³.”

As originally written, AB 1953 contained no provisions regarding the implementation or enforcement of its more restrictive lead content limits for plumbing fittings and fixtures. These issues were partially addressed by subsequent legislation in 2008, specifically California Senate Bill (SB) 1395 and SB 1334. SB 1395 grants the DTSC the authority to annually test up to 75 faucet, fitting and fixture samples for



compliance with AB 1953's lead content limits and to post the results of that testing on its website. Under the law, the DTSC must use "test methods, protocols, and sample preparation procedures that are adequate to determine total lead concentration in a drinking water plumbing fitting or fixture to determine compliance with the lead content standards⁴."

Of potentially even greater importance to manufacturers, California SB 1334 requires that all plumbing products that come in contact with potable water be certified by an independent third-party accredited by the American National Standards Institute (ANSI). Such third party certification must include the testing of plumbing products consistent with the testing methods and protocols used by the DTSC. As implemented under California HSC 116875, the product certification provisions of SB 1334 became mandatory as of Jan. 1, 2010⁵.

In Vermont, the Lead in Consumer Products Law, Act 193, implements lead content restrictions for plumbing fittings and fixtures consistent with those in California and with the new federal limits under the Reduction of Lead in Drinking Water Act, i.e., not more than a weighted average of 0.25% for plumbing fixtures and 0.20% for solder or flux used in plumbing. Under Vermont 193, which came into effect on Jan. 1, 2010, noncompliant plumbing fittings or fixtures may not be sold or offered for sale in or into Vermont or installed in Vermont. Unlike California's requirements, Act 193 does not require plumbing supplies to be certified by an independent third-party laboratory to be legally sold in Vermont. However, "sellers and installers must

have a reasonable basis for believing that a particular product is compliant before selling or installing it⁶."

In Maryland, House Bill 372 was signed into law by Governor Martin O'Malley in May 2010 and takes effect on January 1, 2012. The Maryland lead-free materials law limits the lead content of specified plumbing materials to levels consistent with the current laws in California and Vermont, and prohibits the installation of a plumbing fixture or device that does not comply with the lead content limits. Importantly, the law authorizes the Maryland State Board of Plumbing to modify the state's plumbing code in order to implement and enforce the new requirements⁷.

As previously noted, the current laws in California and Vermont governing the lead content of plumbing fittings and fixtures as well as pending laws in Maryland and other states are likely to lead manufacturers to seek compliance with reduced lead content limits well ahead of the January 2014 implementation date of the federal Reduction of Lead in Drinking Water Act. In addition, even without federal certification requirements regarding the lead content of plumbing products, California's mandate for third-party certification establishes a de facto national testing and certification requirement, since most manufacturers will likely seek a single approval path that covers both federal and state requirements. For that reason, it is important to understand the standards and testing protocols that support third-party certification of lead content in plumbing fittings and fixtures.

Applicable Standards and Testing Protocols

While a number of states have moved quickly over the past few years to enact regulations aimed at reducing the lead content of plumbing products, implementation of these regulations generally depends on the development of standards and testing protocols that support manufacturers' efforts to comply with new limits. Further, effective enforcement of both state and federal requirements largely depends on updating applicable plumbing and building codes to reflect standards development efforts. Although efforts to develop new standards and update applicable codes usually lag the pace of regulations, standards development groups and code officials have worked energetically with industry to provide appropriate guidance to manufacturers seeking compliance with the lower lead content requirements for plumbing fittings and fixtures.

ANSI/NSF 61 was first published in 1988 to establish minimum requirements for products that contact drinking water in order to prevent adverse health effects in humans from the unintentional ingestion of metallic and non-metallic contaminants, including lead. The standard includes criteria for evaluating a wide range of plumbing products, including pipes and related products, and mechanical plumbing devices.

The requirements found in model plumbing codes like the IPC and the UPC are often the basis for plumbing regulations in local jurisdictions. These requirements are typically incorporated



by reference in local building and plumbing regulations, and local plumbing inspectors effectively enforce these requirements through the permitting process and follow-up inspections. The adoption of ANSI/NSF 61 by both the IPC and the UPC enabled enforcement of the SDWA by leveraging the oversight and infrastructure already in place through local plumbing officials and inspectors.

In this context, the passage of California AB 1953 in 2006 presented several challenges for both manufacturers and code officials. First, the testing method described in ANSI/NSF 61 assessed the content of lead and other regulated substances by measuring the amount of contaminants that leached from tested products into water. But ANSI/NSF 61 did not specify analytical methods or protocols that would allow manufacturers to directly measure the lead content of the materials themselves, consistent with the weighted average lead content requirements of AB 1953.

Second, the scope of products covered under ANSI/NSF 61 was more limited than that covered under the California law. The requirements of ANSI/NSF 61 applied primarily to plumbing products. But AB 1953 (as codified in HSC Section 116875) applies to “any pipe, pipe or plumbing fitting, or fixture intended to convey or dispense water for human consumption through drinking or cooking,⁸” and some interpretations of the law have included items as diverse as hot water heaters and fire hydrants.

Finally, updating industry standards to reflect regulatory changes is a lengthy process, and the adoption by new and

revised standards by national code organizations can take years. Since the product scope and testing requirements of California AB 1953 were not consistent with those of ANSI/NSF 61, oversight and enforcement of the requirements through the local plumbing code system would not be possible.

In partial response to these challenges, the NSF Joint Committee on Drinking Water Additives was tasked with amending ANSI/NSF 61 to incorporate criteria for the weighted average lead content requirement of AB 1953. The result of this effort was the development of Annex G for ANSI/NSF 61 published in January 2009. Intended to be used in conjunction with ANSI/NSF 61, Annex G defined a method for calculating the weighted average lead content of a product, consistent with the requirements of AB 1953⁹.

However, while the publication of Annex G provided a method for calculating lead content, it did not expand the scope of ANSI/NSF 61 to include the full range of products identified in the California law. More important, Annex G failed to define specific testing requirements and methods for analyzing the lead content of materials. So the NSF Joint Committee turned its attention to the development of a new standard that would address these shortcomings. The result was the development of ANSI/NSF 372 – Drinking Water System Components, Lead Content released in late 2010.

ANSI/NSF 372 contains the lead content evaluation procedure originally detailed in ANSI/NSF 61 Annex G, as well as testing requirements and methodologies for

material lead content analysis. Further, the scope of the standard applies “to any drinking water system component that conveys or dispenses water for human consumption through drinking or cooking,¹⁰” mirroring the scope of AB 1953. Because ANSI/NSF 372 does not address contaminants other than lead, it can be used in those jurisdictions which have adopted requirements similar to those in California, but which do not mandate compliance with ANSI/NSF 61.

With the introduction of ANSI/NSF 372, Annex G of ANSI/NSF 61 has been revised to reference ANSI/NSF 372 for the evaluation of the weighted average lead content and lead content material analysis. This change makes ANSI/NSF 372 the primary standard regarding lead content in drinking water system components.



Anticipated Enforcement and Compliance Efforts

At the national level, integrating ANSI/NSF 372 into national plumbing codes and applicable product performance standards is likely to take some time. Revisions to the 2012 edition of the UPC and IPC have already been completed, and the underlying performance standards for plumbing products are now being updated to reference ANSI/NSF 372. It is expected that these changes will be completed in time for the January 2014 implementation date of the provisions of the federal Reduction of Lead in Drinking Water Act, thereby providing the necessary mechanism to achieve enforcement through local plumbing officials and inspectors.

In the meantime, manufacturers of drinking water system components are still subject to the lead content

requirements already in force in California and Vermont and the certification requirements in force in California. As previously noted, the California DTSC has the authority to test up to 75 faucet, fitting and fixture samples annually for compliance with that state's lead content limits, and to post the results on its website. The DTSC's "Interim Drinking Water Plumbing Products Sampling and Evaluation Strategy and Procedures" provides manufactures with detailed information on its sampling and evaluation process¹¹.

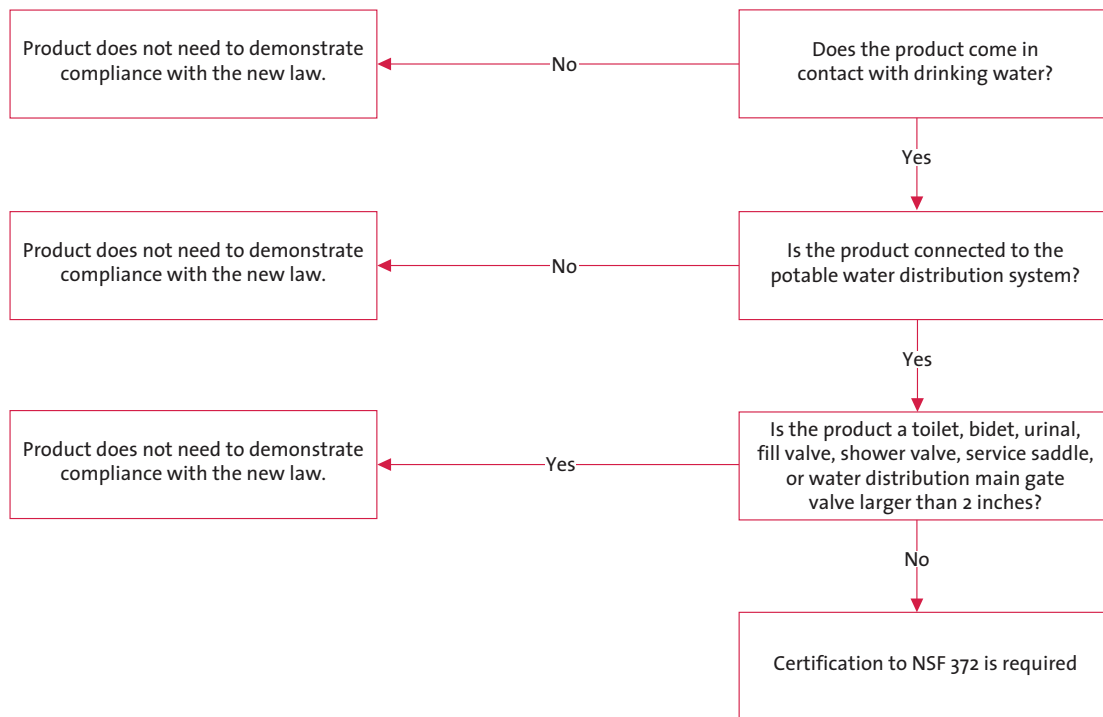
Designing multiple versions of a product for different markets is a complex and inefficient proposition for product designers and manufacturers. Therefore, many manufacturers of products that come in contact with potable water have already redesigned their products to comply with the lead

content requirements in force in California and Vermont. Taking such action ensures compliance with the regulations already in place in those states as well as those scheduled to take effect in Maryland in January 2012 and nationwide in January 2014 under the revised SDWA lead-free limits.

To ensure continued legal access to the California marketplace, manufacturers whose products come in contact with potable water are also having their products tested and certified by an accredited third-party, consistent with that state's requirements. Some testing laboratories (including UL) are offering testing and certification to ANSI/NSF 372 for those manufacturers exclusively interested in certifying product compliance with lead content requirements.



Flowchart: Decision Tree for Determining the Need for Compliance to the Reduction of Lead in Drinking water Act Via ANSI/NSF 372 Certification



These requirements cover the evaluation of wetted surfaces of products, components, and materials that convey or dispense water that is intended for human consumption by drinking or cooking for lead (Pb) content.

These requirements do not cover other health risk aspects of these products, components, and materials such as contaminants that may leach into the water from materials of which the product is manufactured.

The final acceptance of a product, component, or material is dependent upon its compliance with the requirements and standards that a local, state, federal, or other jurisdictional body has defined for the product or component.

All products that are covered by the scope of ANSI/NSF Standard 61 will require certification to ANSI/NSF372.

Figure 1: This flowchart depicts a process to assess whether certification requirements apply to specific drinking water system components, and details the prescribed testing sequence.

As previously noted, California’s certification requirement is likely to create a defacto national testing and certification requirement, since most manufacturers will seek a single approval path that covers both

federal and state requirements. In addition to easing the product compliance process, third-party certification also provides confidence to distributors, retailers and consumers that a manufacturer’s product is

compliant with the new lead-free limits and contributes to the overall safety of drinking water. Therefore, manufacturers can realize tangible benefits from having their products certified by an accredited testing laboratory.



Summary

Regulatory efforts to minimize the lead content in drinking water are currently focused on reducing the lead content in drinking water system components and all other products that come in contact with potable water. While new national lead-free limits will go into effect in 2014, strict state limits and testing requirements are already in force. Manufacturers are quickly working to bring their products into compliance, and obtaining the product certifications necessary to comply with specific state regulations. Taking such steps will ensure uninterrupted market access, provide competitive advantage and contribute to the health of consumers.

For more information about the “An Overview of Regulations for Lead Levels in Drinking Water System Components” white paper, please contact Tom Bowman, program manager, UL Water Systems Program, at Thomas.A.Bowman@us.ul.com or Jeff Hebenstreit, UL principal engineer, Drinking Water Systems, at Jeffrey.R.Hebenstreit@us.ul.com.

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